



NEXT GENERATION TECHNOLOGIES TO COUNTER PROLIFERATION

By Dr. Mildred Donlon

This is the second of two articles written by Dr. Donlon. In the first article, the [Surface Acoustic Wave Smart Sensor System](#) and the [Fiber Optic Biosensor for Biological Warfare Defense](#) were discussed. For details, see the feature story in the Summer '97 issue, Vol. 3, No. 3 of the CBIAC Newsletter.

The Counterproliferation Support Program (CPSP) was established in 1994 by the Counterproliferation Program Review Committee (CPRC) to address DoD shortfalls in counterproliferation capabilities. The CPRC managed by the Assistant to the Secretary of Defense (Nuclear and Chemical and Biological Defense Programs) (ATSD (NCB)), uses its budget to leverage DoD acquisition programs to meet the counterproliferation priorities of the Commander-In-Chiefs (CINC's) and accelerate the development of enhanced capabilities to the field. Two technologies initiated by the Defense Advanced Research Projects Agency (DARPA), initially funded by the Non-Proliferation Center (NPC), and supported by CPSP for acceleration to the field, are outlined below.

MINIATURIZED MASS SPECTROMETER FOR BIODETECTION

The mass spectrometer has the capability to be a generic classifier and identifier for counterproliferation applications since any chemical or biological material will produce a signal. At its most basic level, mass spectrometry is an extremely high resolution technique for the determination of the masses of molecules and specific fragmentation products formed during vaporization and ionization. A mass spectrometer functions as follows: A sample derived from the environment is inserted into the vacuum space of the instrument and subjected to ionizing energy. A spectrum (intensity vs. mass-to-charge ratio) is ac-

quired of the ions formed, and this spectrum is interpreted to identify and quantify the chemical or biological substance. The technique generally begins with samples of relatively large molecules that are intelligently cleaved into smaller fragments that are characteristic of the larger molecules. The spectra of these smaller fragments are then fully analyzed and refined to produce verifiable signatures of the substances of interest. From detailed analysis of the mass distribution of the molecule and its fragments, molecular identification can be accomplished. These molecular measurements can be carried out at the attomole (10^{-18} mole) level of material using specialized laboratory-based instruments within milliseconds. The combination of specific molecular identification and extreme sensitivity makes mass spectrometry one of the most powerful analytical laboratory tools yet developed for detection and identification of chemical and biological substances. While such capability has existed in the laboratory for many years, a DARPA and CPSP-funded collaborative effort between The Johns Hopkins University Applied Physics Laboratory, the University of Maryland Baltimore County, The Johns Hopkins University School of Medicine, and the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) is focused on the development of a small, portable, pseudo-tandem mass spectrometer for **field detection** of chemical and biological substances.

The time-of-flight (TOF) mass spectrometer has long been considered an excellent candidate for field portable operation due to its ruggedness, intrinsic low weight, and simplicity of operation. A synergistic modeling/prototype development approach to miniaturization of the TOF mass spectrometer has been carried out. Using realistic electrostatic modeling, ion creation in the source region has been carefully tailored and advanced ion reflectron-based kinetic energy correction schemes have been employed. Based on these modeling re-

sults, a series of prototypes that use state-of-the-art analog to digital converters and very fast pulsed lasers has been constructed. The combination of realistic modeling and advanced hardware has led to a small yet extremely powerful prototype TOF mass spectrometer (figure 1).



Figure 1: Prototype Tiny TOF Mass Spectrometer System.

This spectrometer has a coaxial design, whereby ions are created and accelerated in the source region, allowed to drift across a field-free region, and caused to enter an ion mirror that reflects the ions back toward the channel electron multiplier detector.

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Contract Awards

1. Laser Resonant Reflector
Optex Systems Inc.
850 N. Dorothy Drive, #510
Richardson, TX 75081-2769
\$50,867. September 29, 1997
By U.S. Army Armament and Chemical Acquisition and Logistics Activity
2. Chemical Barrier Skin Protective Compound
Venus Laboratories Inc.
15571 Commerce Lane
Huntington Beach, CA 92649
\$26,775. September 17, 1997
By Defense General Supply Center
3. Biological Detection and Identification Technologies
SRI International
333 Ravenswood Ave.
Menlo Park, Ca 94025-3493
\$990,784. September 17, 1997
By Defense Advanced Research Projects Agency
4. Engineering and Manufacturing Development (EMD) of the Joint Services Lightweight Standoff Chemical Agent Detector (JSLSCAD) Intellitec
Div. of Technical Products Grp.
2000 Brunswick Land
DeLand, FL 32724-2001
\$30,228,070. September 12, 1997
By U.S. Army Chemical and Biological Defense Command
5. Biological Detection and Identification Technologies
Pacific-Sierra Research Corporation
2901 28th Street, Suite 300
Santa Monica, CA 90405
\$1,599,391. August 15, 1997
By Defense Advanced Research Projects Agency
6. Reversible Fiber Optic Biosensor for Detection of Explosives
Physical Optics Corporation
20600 Gramercy Place, Bldg. 100
Torrance, CA 90501
\$99,878. August 7, 1997
By U.S. Army Research Office
7. Novel Approach for Biological Agent Detection by Means of Spor-Specific Phosphorescence
IIT Research Institute
10 West 35th Street
Chicago, IL 60616
\$650,977. August 5, 1997
By Defense Advanced Research Projects Agency
8. Research and Development Effort for "Detection of High Explosives and Their Degradation Products with Biosensors Containing Responsive Genetically Engineered Protein Pores"
Texas Experiment Station
332 Wisenbaker Engineering Research Center
College Station, TX 77843-3000
\$149,546. July 8, 1997
By Department of the Army
9. M45 Chemical Biological Protective Mask
Campbell Plastics Engineering & Manufacturing Inc.
130 South Klug Circle
Corona, CA 91720
\$5,116,045. August 8, 1997
By U.S. Army Armament and Chemical Acquisition and Logistics Activity
10. Chemical Protective Clothing
E.I. Dupont Denemours & Co.
P.O. Box 6119
Delaware Technology Park
Newark, DE 19714
\$200,000. June 18, 1997
By U.S. Army CECOM
11. Capturing Influenza Virus Using Hemoglutin and/or Neuraminidase Ligands
University of Alabama at Birmingham
1170 Administration Building
701 20th Street
Birmingham, AL 35294
\$473,000. July 1, 1997
By Defense Advanced Research Projects Agency
12. Chemical Process Models for Supercritical Water Oxidation of Toxic Organic Materials
CFD Research Corporation
215 Wynn Drive
Huntsville, AL 35805
\$100,000. July 17, 1997
By Army Research Office at Research Triangle Park

Francis T. Crimmins Retires



On October 10, 1997, Francis T. Crimmins retired from his position as Director of the CBIAC and Associate Director of Battelle Edgewood Operations (BEO).

Fran joined Battelle in 1986 to serve as Battelle's program manager of the CBIAC contract. He was instrumental in developing the CBIAC to be the DoD focal point for the collection and dissemination of Chemical and Biological (CB) Warfare/Defense information. During his watch, the CBIAC conducted over 800 Technical Area Tasks for organizations throughout the DoD.

Prior to joining Battelle, Mr. Crimmins spent over 20 years on active duty with the United States Air Force, managing numerous research, development and acquisition programs, many related to CB Defense.

Fran and his wife, Joy, have relocated to Niceville, Florida. Post retirement plans include refining his golf game and working part time as a consultant in CB Defense.

The CBIAC wishes him well in his new home and retirement lifestyle!

*Best of Luck in
your retirement!*

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This mass spectrometer displays very good performance when tested with pure compounds, however in a field environment the samples are often quite heterogeneous. For this application, a separation technology coupled to a mass spectrometer is a powerful combination. An extremely rapid tandem methodology is the coupling of two TOF mass spectrometers that is currently being developed in collaboration with Massachusetts Institute of Technology (MIT) - Lincoln Laboratories. The first TOF acts as an extremely rapid separation device to measure the precursor ions and the second TOF efficiently measures the product ions. Novel configurations of the ion reflectron, invented and patented by Dr. Robert Cotter of the Johns Hopkins School of Medicine, provide the potential for tandem capabilities in the type of small TOF mass spectrometer just described. Engineering estimates show that a small pseudotandem TOF mass spectrometer can be reasonably reduced in size to a package roughly 30 cm x 15 cm x 15 cm with a weight of less than 5 kg and with power requirements of less than 100 W. A device of this size with the extreme sensitivity and selectivity of mass spectrometry technology leads to a detector that is ideally suited for the detection of a broad range of biological materials in the environment. This is of significant advantage to field applications in that no liquids are required for detection.

The DARPA/CPSP program seeks to develop a completely automated system for detection of biologically derived agents. A schematic diagram of the proposed system is shown below (figure 2).

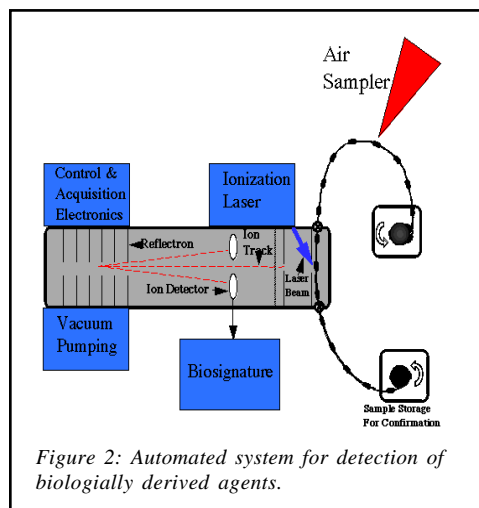


Figure 2: Automated system for detection of biologically derived agents.

This system will feature several components: A specialized aerosol sampler that collects the sample on a flexible tape (and stores the sample for later confirmatory analysis), a custom vacuum interface between the tape collection and the vacuum of the mass spectrometer, a miniaturized tandem time-of-flight mass spectrometer, a small high efficiency vacuum pumps, fast digitizing and control electronics, and automatic signal processing with a simple user interface. The ultimate goal of the program is to produce a small, lightweight, low-power detection system that has the following features: high sensitivity, speed, specificity, wide agent bandwidth, high collection efficiency, continuous monitoring capability, remote operation, no liquid consumables, and long shelf life.

In order to achieve this goal, the major tasks that must be completed are: the further development of validated mass spectral signatures for all of the agents of interest, the continued development and ruggedization of the mass spectrometer instrumentation for field use, and the incorporation of the signal processing tools into an automatic identification methodology. Finally, the system must be exercised in realistic scenarios that benchmark the detection performance in a real world environment. The miniaturized mass spectrometer detection system will be completed and will have a final field test in the fall of 1999.

UPCONVERTING PHOSPHOR BASED BIOLOGICAL AGENT DETECTION: BACKGROUND

Point detection systems involving either antibody (immuno)- or nucleic acid (DNA)-based assay techniques show promise for the precise identification of microorganisms. Current assay-based diagnostic techniques available for the detection of biological materials typically involve the screening of multiple samples. This process is not only very time consuming and expensive, but also tedious, thereby increasing the potential for technical errors. SRI International has developed a proprietary diagnostic detection technique that shows great promise of achieving significant improvements in detection times, sensitivities, and specificities. This new technology involves the use of upconverting phosphors coupled to diode laser excitation/detection system. The phosphors are chemically linked to phosphor probe units to produce a reagent with a high degree of certainty to the biological agent to be detected.

The phosphors emit light at wavelengths that are shorter than the excitation wavelength. In other words, the emitted photons have a higher energy than the excitation photons. This is possible because two or more photons are absorbed for each emitted photon. Upconverting phosphors consist of rare earth ions in an inorganic crystalline submicron particle. By varying the nature of the absorber and emitter ions as well as the crystalline host material the emission spectra of the submicron particles can be varied. The materials have very narrow excitation and emission bands. These features lead to the multiplexing advantage of this reporter system for simultaneous multianalyte assays, a critical step in decreasing the time to identification. At this time, nine spectrally unique reporters have been developed, some twenty different colors are anticipated. The Army - Edgewood Research, Development and Engineering Center (ERDEC) is currently funding phosphor development. Upconverting phosphors are excited typically in the near infrared (980 or 1500 nm), which makes them well suited for use with diode lasers thereby leading to compact, inexpensive detection systems. Furthermore, a single excitation wavelength causing multiple color emissions provides a significant advantage over fluorescent reporters where multiple excitation wavelengths are necessary. Because upconversion does not occur in natural materials, there is no optical background as seen when using fluorescent reporters. The detection sensitivity is limited only by the detection noise and the assay mechanisms (nonspecific binding, assay efficiency, etc.). The upconverting phosphors do not photobleach as do fluorescent reporters, and are insensitive to their environment.

Compact Upconverting Phosphor-Based Flow Cytometer for Biological Agent Detection

Flow cytometry is under evaluation for the detection function in rapid response systems (e.g., BIDS and JBPDS) for biological weapons that may be used on the battlefield. It is also being considered for the identification function in these rapid response systems. However, flow cytometry as conventionally practiced exhibits some significant limitations for this application to include unacceptable size, weight and power, inability to perform

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ONGOING AND RECENT ACTIVITIES

Current Awareness and Promotions

- Ron Evans, Fran Crimmins, Bill Jackson, and Mike Janus attended the **Emergency Management Technology Partners Workshop**, sponsored by the Federal Emergency Management Agency (FEMA) and the Pacific Northwest National Laboratory (PNNL), September 22-25, 1997 in Richland, Washington. The CBIAC display highlighted Technical Area Task efforts in support of the U.S. Army CBD COM Disaster Preparedness Program.
- Jeanne Rosser attended the **Air Force Scientific and Technical Information (STINFO) Program 1997 Training Conference and Workshop**, held September 24-26, 1997 at Oglebay in Wheeling, West Virginia. The CBIAC display presented the latest in CBIAC products and services.
- Representatives from the CBIAC attended and staffed our display at the **DTIC '97 Annual Users Meeting and Training Conference**, November 3-6, 1997, in Arlington, Virginia. Information on CBIAC products and services was available. The CBIAC demonstrated the Internet access to the **CBIAC Bibliographic Database (BD)** at our exhibit location.
- The CBIAC is planning to attend and display at the Jane's Conference on **Countering Chemical and Biological Weapons: Government Programs, Industry Opportunities**, November 19, 1997 in Washington D.C. Look for our display highlighting CBIAC products and services.

Inquiry and Referral Services

Last quarter, the CBIAC responded to 164 inquiries. Twelve percent of the requesters sought information on NBC Survivability while another 11 percent were seeking information on Warning and Identification.

Products

The CBIAC has released its latest State-of-the-Art Report entitled, *Overview of U.S. Chemical/Biological Defensive Equipment*. See the back cover for further details.

Technical Area Tasks (TATs)

Since the last newsletter, 12 new tasks were awarded, effort was added to 35 ongoing tasks and six tasks have been completed. As of 30 September 1997, a total of 138 TATs have been awarded and work has been added to 190 tasks. Total value of TATs awarded is over 61 million dollars. The chart at the bottom of the page shows the percentage of TAT work sponsored by each branch of the armed forces for 4th quarter FY97, along with the funding (in millions) provided by each organization.

Do not hesitate to contact Judith Shetterly, CBIAC Administrator, if you would like further information on a CBIAC TAT. In order for us to help you most efficiently, please furnish the Government Contract Number you are working on (if any), the reason(s) you want the information, and your company address and phone number. We need this information in order to obtain release of information from the TAT sponsor.

Completed:

Task	Description/Sponsor
8	Evaluate USN CBR-D Systems Logistics and Acquisition Strategies, Milestone and T&E Reviews, Technology Planning, and Development. USN/NAVSEA
9	Analyze Critical Performance and Technical Requirements and Conduct Technology Assessments for USN Advanced and Engineering Development Model CBR-D Systems. USN/NAVSEA
19	Evaluate, Analyze and Assess USAF NBC R&D Technical Documentation Including Operational Requirements Test and Evaluation Plan, Design Requirements, etc. USAF/HSC

24 For the F-111 Aircraft, Evaluate the Decontaminability of F-111 Coupons; Compare to F-111 Flight Data; and Normalize the Residual Chemical Hazard Model.
USAF/HSC

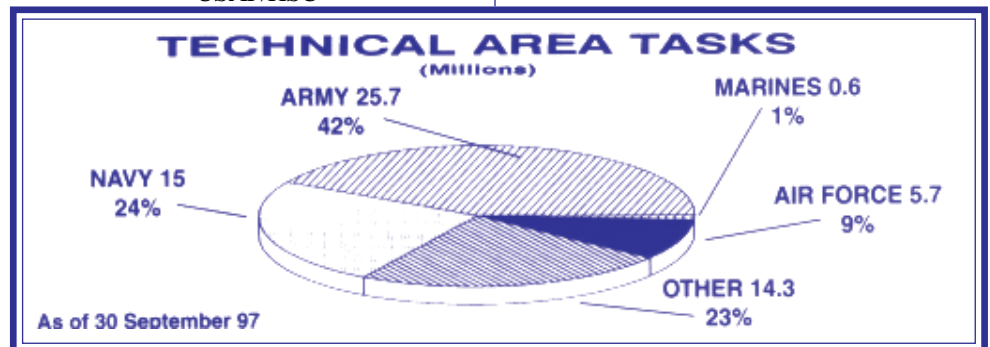
49 Provide Technical and Administrative Support to the 1995 U.S./German Environmental Data Exchange Meeting.
USA/ERDEC

Underway:

Task	Description/Sponsor
244	Assess ERDEC Procedures Used to Validate Performance of In-place, Fixed Site CB Filters. USA/ERDEC
257	Evaluate Feasibility of Integration of PSA/ECU CB Filtration into a USMC AAV7A1. USA/ERDEC
261	Collect and Analyze Information Related to Integrated Armor; Prepare Information Dissemination Packages. USA/NRDEC
262	Provide Technical Support to Chemical and Biological (CB) Panels for Non-proliferation Advisory Council (NPAC) Technical Working Group (TWG). OSD(AE)(CBM)
268	Develop Validated Criteria and Assessments to Certify Capability of Defensive Missile System Concepts to Destroy CB Threat Missiles. OSD/BMDO
270	Provide NBC Defense Operation and Procedures Technical Support To USAF/HSC. USAF/HSC

Ongoing and Recent Activities

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CB NEWS EXCERPTS

In order for the CBIAC to inform its readers of recent Chemical/Biological Defense activity throughout the United States and around the world, we have compiled a list of related CB news articles and have taken excerpts from them to create brief overviews. Please note that the CBIAC does not provide secondary distribution of articles. We can, however, provide direction on where to find an article of interest. For further information contact Mary Frances Tracy at 410-612-6417 (tracymf@battelle.org).



Ember, Lois. *Detoxifying Nerve Agents*, **Chemical & Engineering News**, 15 September 1997. Keith E. LeJeune, a graduate student at Carnegie Mellon University, Pittsburgh, has developed and incorporated, into polyurethane foam, enzymes that detoxify nerve agent. LeJeune has been able to enhance the enzyme's productivity by immobilizing phosphotriesterase in a polyurethane foam matrix. He has shown, by linking phosphotriesterase covalently to the foam matrix, that the enzyme can efficiently hydrolyze the organophosphate bond in the pesticide paraoxon, a nerve agent analog. Using 2.5 kg of immobilized phosphotriesterase, the researchers calculate that this is probably enough to degrade 30,000 tons of nerve agent in one year. One avenue of use being explored is using a sponge or wipe to cleanse protective clothing and skin exposed to nerve agents. The initial medical outlook focused on detoxifying the area around a wound and the protective clothing worn by an injured soldier. In addition, from the medical perspective, the sponges provide promise as part of a decontamination system for civilian use.

Lin, William. *CDTF Sets Milestones*, **Army Chemical Review**, July 1997. In March 1997, Fort McClellan's Chemical Defense Training Facility (CDTF) set two milestones when the 40,000th individual completed toxic agent training and the facility celebrated its 10th anniversary. Originally constructed as an

Army facility, it is now a joint service and international training center. It is a "one-of-a-kind" facility in the world and is used to train personnel to survive in a chemically contaminated environment. As the only toxic chemical agent training facility within the DoD, the CDTF specializes in the survivability of Army, Navy, Marine Corps, and Air Force NBC specialists and also federal, state, and civil authorities, including law enforcement officials. The facility features seven negative pressure training bays; a toxic agent preparation laboratory; a technical support section to clean, service, and certify protective equipment; and a solid/liquid waste incinerator.

Roos, John G. *Countering the Bio Threat*, **Armed Forces Journal International**, August 1997. With the ever present threat of a chemical or biological (CB) terrorist attack, the U.S. government recently created the Terrorism Warning Group within the Central Intelligence Agency. The primary function is to provide early warning of a terrorist threat to military and civilian officials. In the event that a CB attack can not be prevented, the U.S. Army's Technical Escort Unit (TEU) and the Marine Corps' Chemical/Biological Incident Response Force (CBIRF), united under the soon-to-be-established "Chem-Bio Quick Response Force," are prepared to assist in lifesaving and damage-limiting activities. Additionally, to warn of a CB attack, the U.S. Army has outfitted the 310th Chemical Company with 35 Biological Integrated Defense Systems (BIDS). In June, an Advanced Concept Technology Demonstration (ACTD) named "Bio 9-1-1" was conducted by the Joint Program Office for Biological Defense (JPO-Bio) to test several new biological detection and decontamination remediation devices. The promising breakthroughs included a modified BIDS; the Hand-Held Assays in which antibodies cling to colored beads and indicate suspected biological agents; a 14-person Forward Deployed Laboratory; the New Horizons Model 3550 Microluminometer which reacts to the presence of molecules used to transfer energy within living cells in about 5 minutes; the Personal Aerosol Exposure Monitors which would record wearers exposures to particular agents; and the mobile Decontamination System for Large Vehicles which was designed to decontaminate, detoxify, and disinfect vehicles.

Carey, Christopher T. *Focus on Respirators: Two Hood Type NBC Respirators*, **The ASA Newsletter**, 23 August 1997. Today's respirator technology for NBC protection is found in two common designs: conventional military style respirator (face-fit) and the hood style respirator that covers the wearer's entire head. Face-fit respirators are expensive due to the extensive ergonomic data required for a successful design and effective development. Although an old concept, the whole head hood respirator is now showing a resurgence. The preeminent designs for use by a large range of civilians and age groups are: the American ILC Dover, Inc. D.E.R.P. (Disposable Eye Respiratory Protection) and the Finnish Kemira Safety Civic Chemi-Hood. Although similarities exist, the D.E.R.P. was developed as a disposable, single use item which meets all requirements for providing protection against current CBW agents. The Kemira Chemi-Hood was designed to give a more prolonged protection capability. Further details of each hood may be obtained from the ASA Newsletter.

Gillert, Douglas J. *Mustard Gas Exposure Likely, Report Finds*, **American Forces Press Service**, 26 September 1997. With DoD's release of the sixth case narrative on the Gulf War illness investigation, this write-up discusses Army Pfc. David Fisher's "likely" suffering from mustard gas exposure after examining an Iraqi bunker March 1, 1991. DoD is reporting the chemical agent could have been left over from earlier bunker use. While Fisher was assigned to the 3rd Armored Division, he was likely exposed to mustard gas while exploring enemy bunker complexes near the Kuwait-Iraq border. Fisher developed blisters eight hours after the exposure. Fox reconnaissance vehicle readings of the bunker and Fisher's clothing were positive, along with Fisher's urine. However, when the urine and clothing were retested in the U.S., they failed to test positive for exposure to mustard. Fisher's case appears to be isolated with no other similar exposures being reported. Following the incident, Fisher filed a medical claim with the Department of Veterans Affairs, primarily for his concerns with memory loss. No recurring problems have been reported as a result of scarring from the mustard burns.

CALENDAR OF EVENTS

The CBIAC highlights conferences, symposia, meetings, exhibitions and workshops of interest to the CB community in every issue of our newsletter and on our website. We invite CBIAC users to submit information on various events to Mary Jo Waters at 410-612-6418 (watersm@battelle.org). Due to space limitations, the CBIAC will accept submissions on a first-come, first-served basis and reserves the right to reject submissions.

1997 MEETINGS

Date/Name/Location	Contact(s)	Date/Name/Location	Contact(s)
November 14 1997 Air Force Association National Symposium "National Security - The Space Dimension" Beverly Hilton Hotel Los Angeles, CA	Air Force Association (AFA) Attn: Jennifer Krause 1501 Lee Highway Arlington, VA 22209-1198 Tel: (800) 727-3337 ext. 5838 Fax: (800) 232-3563, order document #320 E-mail: JKrause@afa.org URL: http://www.afa.org/lasymp.html	December 7-11 Chemical and Biological Medical Treatment Symposia Series CB MTS Middle East I Cairo, Egypt	The Egyptian Society of Pesticide Hazards (ESPH) and Applied Science and Analysis (ASA) P.O. Box 17533 Portland, Maine 04112-8533 Tel: (207) 829-6376 Fax: (207) 829-3040 URL: http://www.asanltr.com E-Mail: asa@ime.net or 75222.637 @compuserve.com
November 18-21 Scientific Conference on Chemical and Biological Defense Research CBDCOM Conference Center Aberdeen Proving Ground, MD	U.S. Army Edgewood Research Development and Engineering Center (ERDEC) Attn: Dottie Berg APG, MD 21010-5423 Tel: (410) 671-4883/4144 DSN: 584-4883/4144 Fax: (410) 671-2649 E-Mail: dxberg@cbdcom.apg.army.mil URL: http://www.stcrnet.com/meetings/erdecinfo.html	1998 Meetings	
November 19 Countering Chemical and Biological Weapons - Government Programs Industry Opportunities Hyatt Regency Washington, DC	Jane's Information Group Jane's Conferences 1340 Braddock Place, Suite 300 Alexandria, VA 22314-1651 Tel: (703) 683-3700, ext. 204 or (800) 824-0768, ext. 204 Fax: (703) 836-0118 E-Mail: sullivan@janes.com		
December 1 Defense Manufacturing Conference (DMC '97) Palm Springs, CA	DMC '97 c/o Universal Technology Corporation (UTC) 1270 North Fairfield Road Dayton, OH 45432-2600 Tel: (937) 426-2808 Fax: (937) 426-8755 URL: http://mantech.iitri.com/dmc97/index.shtml	February 8-11 NEMA's Mid-Year Conference Renaissance Mayflower Hotel Washington, DC	National Emergency Management Association (NEMA) P.O. Box 11910 Lexington, KY 40578 Tel: (606) 244-8000 Fax: (606) 244-8239
December 3-5 3rd Annual Strategic Environmental Research and Development Program (SERDP) Symposium Washington Hilton Hotel Washington, DC	SERDP Support Office c/o HydroGeoLogic, Inc. 1155 Herndon Pkwy. Suite 900 Herndon, VA 20170 Tel: (703) 736-4548 Fax: (703) 736-4500 URL: http://www.hgl.com/serdp/	March 1-6 PITTCON '98 Morial Convention Center New Orleans, LA	Pittcon '98 Attn: Dr. John P. Baltrus, Program Chairman The Pittsburgh Conference 300 Penn Center Blvd. Suite 332 Pittsburgh, PA 15235-5503 Tel: (412) 825-3220 Fax: (412) 825-3224 URL: http://www.pittcon.org
December 7-10 1997 Winter Simulation Conference Renaissance Waverly Hotel Atlanta, GA	David Withers Tel: (937) 865-1912 Fax: (937) 865-1655 E-Mail: DavidWithers@lexis-nexis.com URL: http://www.wintersim.org	March 30-31 ComDef'98 National Press Club Washington, DC	IDEEA, Inc. Attn: Quentin Whiteree 6233 Nelway Drive McLean, VA 22101 Tel: (703) 760-0762 E-Mail: qhitee@ideea.com
		March 31 - April 2 9th Annual TARDEC Ground Vehicle Survivability Symposium Navel Postgraduate School Monterey, CA	Natioanl Defense Industrial Association (NDIA) 2111 Wison Blvd, Suite 400 Arlington, VA 22201 Tel: (703) 522-1820 Fax: (703) 522-1885 URL: http://www.adpansia.org/events/brochure/tardec/tardeccsp.htm
		April 1-2 DoD Chemical/Biological Mission Area Advance Planning Briefing for Industry (APBI) Johns Hopkins Applied Physics Lab Laurel, MD	U.S. Army Chemical and Biological Defense Command (CBDCOM) Attn: Mr. Ronald Hinkle APG, MD 21010-5423 Tel: (410) 671-2031 Fax: (410) 612-6529 E-Mail: rhinkle@cbdom.apg.army.mil

Date/Name/Location**Contact(s)**

May 10-15

The Sixth International Symposium on Protection Against Chemical and Biological Warfare AgentsStockholm City Conference Center
Stockholm, SwedenCBW Protection
FOA NBC Defense
S-901 82 UMEA
SWEDEN
For Registration:
Tel: 46 90 106 602
E-Mail: molofsson@ume.foa.se
For Scientific Program:
Tel: 46 90 106 773
Fax: 46 90 106 801
E-Mail: persson@ume.foa.se

May 17-21

1998 American Society for Biochemistry and Molecular Biology (ASBMB) Annual MeetingConvention Center
Washington, DCFederation of American Societies for Experimental Biology (FASEB)/OSMC
Attn: Kristin Mirabal
9650 Rockville Pike
Bethesda, MD 20814-3998
Tel: (301) 530-7010
Fax: (301) 530-7014
E-Mail: kmirabal@osmc.fasb.org
URL: <http://www.aai.org/asbmb/>

June 2-6

EUROSATORY'98

Paris-Le Bourget, France

COGES
64 rue de Ranelagh
75016 Paris
France
Tel: 33 (0) 1 44 14 58 10
Fax: 33 (0) 1 42 30 70 88
E-Mail: coges@salon-eurosatory.fr
In the U.S., contact
International Trade Exhibitions
in France (ITEF)
2300 Clarendon Blvd,
Suite 310
Arlington, VA 22201
Tel: (703) 522-5000
Fax: (703) 522-5005
URL: <http://www.salon-eurosatory.fr/anglais/welcome.html>

June TBD

21st Army Science ConferenceNorfolk Convention Center
Norfolk, VADept. of the Army
Attn:SARD-TR/
Catherine Kominos
103 Army Pentagon
Washington, DC 20310
Tel: (703) 697-3558
Fax: (703) 695-3600**1999 Meetings**

July TBD

**Chemical and Biological Medical Treatment Symposia Series
CB MTS III**

Swiss NC Laboratory - Spiez

Applied Science and Analysis, Inc. (ASA)
P.O. Box 17533
Portland, ME 04112-8533
Tel: (207) 829-6376
Fax: (207) 829-3040
URL:<http://www.asanltr.com>
E-Mail: asa@ime.net or
75222637@compuserve.com**An Open Invitation to Join the
Chemical Corps Regimental
Association**

The Chemical Corps Regimental Association (CCRA) would like to extend an invitation to all companies associated with the Nuclear, Biological and Chemical (NBC) Defense Industry (NBC defense/protection/decontamination/detection, demilitarization, counter terrorism, environmental cleanup, etc.) to join with other partners in industry and become a Corporate Member. Corporate patronship allows us to maintain the proud Chemical Corps heritage through support of the Chemical Corps Museum Park at Fort McClellan, Alabama.

The Chemical Corps Regimental Association, Inc., a non-profit corporation, was established pursuant to the provisions of Chapter 3, Non-Profit Corporation of Title 10 of the Code of Alabama. Corporate members receive a copy of the *Chemical Corps Regimental Association Directory*, the "Yellow Book," the *Army Chemical Review* periodical, and *Retorts*, a quarterly newsletter with a distribution approaching 2,000. Names of Corporate patrons are displayed in the museum.

The Board of Directors has executed their Museum Master Plan. Great progress has been made from building and furnishing the Regimental Room to building the World War I and World War II, Korea and Viet Nam exhibits. A considerable amount of work remains to be accomplished and we rely on Corporate Patronship for the funds.

With the impending move of the Chemical School, and the Chemical Corps Museum and Memorial Gardens to Fort Leonardwood, Missouri, the CCRA desperately needs support in the form of money and services from our partners in industry. Without this support we cannot continue in our vision of completing exhibits for all time frames of war and conflict where Chemical Soldiers and the materiel developed and produced by the military-industrial team made an important contribution.

The CCRA has a website at <<http://www.ntl.net/ccfa>> and would like to link corporate members' organizations to its homepage. If you have a website that could be linked to the CCRA homepage or you would like an information brochure or application, please contact COL (Ret.) Morton S. Brisker of Battelle, Vice-President for Corporate Membership at 410-569-0200 facsimile 410-569-0588 or E-Mail, briskerm@battelle.org.



U.S Army Chemical School

NBC Toolbox

Version 1.1

July 1997



by Virginia Doleman Bailey, External Affairs, and Timothy Mallory, SLAD

Tasked by the U.S. Army Chemical School's Doctrine Development Center at Fort McClellan, Alabama, an Army Research Laboratory (ARL) team of engineers and analysts took on the challenge of creating a computerized database designed to provide the Army Chemical Corps Officers and NCO's with instructions for responding to a chemical or biological contamination scenario.

LTC Jerome P. Gilman of the ARL Survivability/Lethality and Analysis Directorate (SLAD) joined forces with other SLAD team members: Mark Mar, an electronics engineer; Timothy Mallory and Robert Murk, mechanical engineers; and Mubasher Hussain, a computer specialist assigned to the ARL Corporate Information and Computer Center (CICC) as a consultant, to create a new computerized database known as the *NBC Toolbox*.

Thanks to the *NBC Toolbox*, Army Chemical Corps Officers and NCO's no longer have to wade through pages of manuals to get instructions on how to respond to a chemical or biological contamination situation. Soldiers can access information within seconds on a computer instead of searching for it in an Army manual.

Here's feedback about the *NBC Toolbox* from the 1997 Worldwide Chemical Conference and NBC Operations Symposium. At the exhibit, LTC Gilman explained, "Since it's platform independent, NBC Toolbox brings a unique capability into the field." Comments from other Chemical Officers include:

"It's like the Grolier Encyclopedia of NBC Defense" by CWO Rich Turville of U.S. Marine Corps.

"Finally, a search engine that allows me the ability to gain access to NBC information and doctrine within seconds on a computer instead of searching for the info in a multitude of Army manuals," by LTC Al Woltz of U.S. Army Chemical-Biological Defense Command.

"One of the most practical products that the Chemical School has ever come out with," by MAJ Mike Avery of the U.S. Army Chemical School.

To date, over 325 copies of the *NBC Toolbox* have been distributed to members of the Chemical Corps worldwide. The U.S. Army Chemical School now uses the *NBC Toolbox* with their Officer and NCO Basic and Advanced Courses, as well as the Joint Services Leader Course.

The *NBC Toolbox* is designed to operate on any type of computer system that uses an Internet browser or runs the Adobe Acrobat Reader. Choices available on the introductory screen are shown below.

- ★ This program enables the user to perform information retrieval related to NBC operations.
- ★ This program provides the user with the ability to search for information relevant to hazards associated with NBC warfare agents. The user can perform searches that will give the information on:

Decontamination: NBC decon of soldiers, equipment, and terrain; Decontaminants; Techniques

Protection: Individual and collective protection; NBC protection

Hazard Prediction: NBC downwind hazard prediction; NBC warning and reporting

Chemical Properties: Physical and chemical properties of NBC agents and compounds

Field Behavior of NBC Agents: Effects of weather/terrain; Diffusion/atmospheric conditions

Other: Other Army, Navy, Air Force, Marine Corps, and Joint Services NBC information

Search the NBC Toolbox

Locate NBC information by entering a choice from the list below.

Enter:

- Subject category (e.g. decon, protection, agent, etc.)
- Keyword(s), phrase or abbreviation
- Enter a Boolean command (AND, OR, NOT) [Click here for help](#)

Follow-on work is planned to integrate computational capabilities in the *NBC Toolbox* which will eliminate the need for the currently used nomograms (graphical charts used to solve complex equations). High fidelity models and simulations will also be incorporated into the toolbox.

NBC Toolbox is available on the WWW or on CD-ROM. For further information on its development or availability, please contact Timothy Mallory, ARL/SLAD at 410-612-8694, or send E-mail to tmallor@ARL.MIL.

Canada's NBC Response Team

by Dr. W. Stewart Myles



On 20 March, 1995, members of a religious cult used nerve agent to attack commuters on the Tokyo subway, killing twelve and injuring thousands more. The Tokyo incident confirmed concerns long held by departments of defence in many countries, that terrorists would eventually turn to chemical, and perhaps biological, weapons. The Canadian NBC Response Team was formed in anticipation of such an event at the Olympic Games held in Montreal in 1976. Fortunately there was no terrorist action at the games and the team was mothballed until it was reactivated in 1985.

In its reincarnation, the team was composed of staff from the NBC School at Canadian Forces Base Borden with the Commandant acting as the team leader. The Defence Research Establishment Suffield (DRES) was asked to provide scientific experts (one with chemical and another with biological expertise) to deploy with the team on all exercises and to be present as scientific advisors in a real emergency. The establishment was also asked to help with training by drafting exercise scenarios for terrorist incidents involving CBW which would fully test the ingenuity of the team. The first two exercises, Brisk Wind I and II, took place on the Experimental Proving Ground (EPG) at Suffield in 1987 and 1988. The scenarios for these and future exercises have frequently required some sort of "terrorist device" and these were produced with the help of experts in explosive effects at DRES. These devices ranged from a booby-trapped tool box to a small juice

carton that would explode and release a white powder to simulate a toxin such as ricin. They were sufficiently like the real thing that the designs are still classified to prevent them falling into the wrong hands. Later exercises, such as the Klaxon Kounter series held in Ontario and Quebec, were designed to test command and control.

The NBC Response Team now works with the Royal Canadian Mounted Police (RCMP) under an agreement between National Defence and the Solicitor General and DRES provides annual training in the handling of "live" agent for the team and some RCMP personnel. The highlight of the three days spent at DRES is a truck decontamination exercise on the EPG using a significant amount of mustard. This kind of training is not available anywhere else in Canada and is critical to building a team confident in their ability to deal with a hazard not encountered in normal bomb disposal operations. DRES also supports the team with R&D and is presently working with the RCMP to develop a decontaminant foam for dealing with a bomb suspected of containing CW agent. With the assistance of DRES, Canada has been able to put together a capability to respond effectively to the terrorist use of CB weapons. Further information can be obtained from the Director of NBC Defence in Ottawa (613-992-6426).

Dr. Myles served as the Director at the Defence Research Establishment Suffield (DRES) responsible for the R&D program in Chemical and biological Defence until his retirement in August, 1996. He is currently a consultant in the area of Chemical and Biological defense. His E-Mail address is myles@telusplanet.net.



Ongoing and Recent Activities

Continued from page 4

- 275 Provide Technical Support for Testing, Studies and Analyses of Individual and Collective Protection Equipment and Technology.
USA/ERDEC
- 282 Determine Performance Degradation of Comanche Materials After Exposure to CW Agent And Decon Solutions.
USA/AV&MICOM
- 288 Provide CBD Related Technical Support to The U.S. Army Soldier System Command's Integrated Armor Group.
USA/NRDEC
- 293 Conduct an Independent Peer Group Review of Standards for Determining CB Detection Limits.
USA/ERDEC
- 297 Chemical Detection Equipment and Collective Protection Technical Support to the CSEPP Program.
USA/CBDCOM
- 299 Evaluate, Analyze and Assess the Status of Technical Programs for the Office of the Project Manager for Nuclear, Biological and Chemical Defense Systems (PM NBCDS).
USA/CBDCOM

CBIAC STATISTICS

Total CBIAC documents accessible through DTIC DROLS: 8,564

Shared¹: 4,975 Unique²: 3,589

Total document citations available through the CBIAC BD: 49,801

Total documents added to the CBIAC BD during Fourth Quarter, FY97: 560

Total documents on site: 28,608

Total inquiries received during Fourth Quarter, FY97: 164

Technical: 46 Informational: 20
Bibliographic: 92 Referral: 6

Total TATs awarded since contract initiation: 138

Completed: 49 Ongoing: 89

Total newsletter subscribers: 2,435

¹ Existing DTIC records appended with CBIAC terms

² New DTIC records created by the CBIAC

SELECTED INQUIRY RESPONSES

This section of the newsletter contains recent inquiries and responses on subjects we feel are of interest to our users. The information presented has been edited to conserve space. If you would like further detail, please contact Steven Jones at 410-612-3411 (joness@battelle.org). Please provide the reference number if available.

Q. What documents and World Wide Web (WWW) sites provide information concerning disaster preparedness?

A. The following documents will provide assistance in the event of contact with chemical hazards:

- *1996 North American Emergency Response Guidebook* (CB-102282). Published January 1, 1996, available through Canada Communication Group-Publishing, Ottawa, Ontario K1A 0S9, Canada.
- *NIOSH Pocket Guide to Chemical Hazards* (CB-102296). Published June 1, 1994, available through the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402

The following websites provide information related to disaster preparedness:

- Emergency Response & Research Institute: <http://www.emergency.com>
- Close Up Foundation Domestic Terrorism Page: <http://www.closeup.org/terror.htm>
- The Disaster Preparedness and Emergency Response Association, International (DERA) Web Links: <http://www.disasters.org/weblink.html>

- Emergency Response Training Institute: <http://iypn.com/emergency response>
- FEMA-EMI: <http://www.fema.gov/emi>
- Terrorism Counter-Terrorism Page: <http://www.emergency.com/>
- First Responders . . . Command and Control: <http://www.disaster-resource.com/first.html>

Q. Is there a website which provides Material Safety Data Sheet (MSDS) for chemical agents?

A. The Edgewood Safety Office provides complete MSDSs for HD-Mustard, GA-Tabun, GB-Sarin, GD-Soman, VX, T, Lewisite, and DS2. Each MSDS provides general information; hazardous ingredients; physical data; fire and explosives data; health hazard data; reactivity data; spill, leak, and disposal procedures; special protection information; special precautions; and transportation data. The website is located at <http://www.apgea.army.mil/safety/msds/index.html>.

"Next Generation Technologies to Counter Proliferation"

Continued from page 3

simultaneous sensitive assays against multiple pathogen targets, and complicated logistics support. The objective of this project is to develop a compact flow cytometer based upon the upconverting phosphor diode laser technology that promises to overcome many of these limitations. This approach uses the submicron phosphor particles as the reporter system, and a single near-infrared diode laser as the excitation source. The compact, reliable and electrically efficient laser source, combined with the availability of many spectrally unique phosphor colors allows for a greater degree of multiplexing than can be achieved using conventional fluorescent reporters and more complicated detection systems. The use of these

phosphor capture beads in flow cytometer immunoassay formats should provide for both detection and identification of numerous pathogen targets. With additional advantages of no photobleaching and no autofluorescence background, increased sensitivity and simpler logistical support requirements in battlefield detection applications appear promising.

Two compact upconverting phosphor-diode laser flow cytometers will be developed that are capable of simultaneous detection and identification of eight antigen targets in a system package that weighs less than 30 lbs and occupies a volume of less than 1.5 ft³. Prototype systems are envisioned that weigh less than 20 lbs and occupy less than 1 ft³.

Technology Transitions

The reagents, assays and instrumentation developed in these efforts will be transitioned into the commercial marketplace as rapidly as possible through the use of subcontracts to 3M Company and Becton-Dickenson, and a key teaming partnership with STC Technologies. Becton-Dickinson will become the commercial partner for manufacturing upconverting phosphor-diode laser flow cytometer instrumentation. In the development of another bio-detection device (not described here) the 3M Company is assisting SRI in the development and optimization of assays using particulate reporters in capture bead formats, and will manufacture disposable fluidics chips samplers. STC Technologies is the commercial license to SRI International for the upconverting phosphor technology, and will be the commercial supplier of reagents and supporting analytical instrumentation.

Dr. Donlon is currently a Program Manager for the Biological Warfare Defense Program in the Defense Sciences Office of the Defense Advanced Research Projects Agency. She manages research programs developing advanced biological detectors for battlefield, counterproliferation, counterterrorism and intelligence applications. For further information Dr. Donlon can be contacted at DARPA/DSO 3701 North Fairfax Drive, Arlington, VA 22203-1714. Her e-mail address is mildonlon@darpa.mil

NEW ACQUISITIONS

The following acquisitions may be reviewed at the CBIAC. Further information on how to obtain or review any of the listed acquisitions is included for your convenience. If you would like further detail, please contact Richard M. Gilman at 410-612-6415 (gilman@battelle.org) at the CBIAC. The CBIAC is not authorized to distribute duplicates of the listed acquisitions.

Biological Warfare theme issue. **JAMA — Journal of the American Medical Association.** Vol. 278, No. 5 (August 6, 1997), pp. 347-446. "This theme issue... touches on a set of timely concerns that unite national security and public health, concerns that cry out for well-articulated convergence of the human community worldwide. Various articles in this issue touch on the historical, diplomatic, and legal background; on modalities of diagnosis and management, and on case studies of small-scale BW attacks that already have been perpetrated, though amateurish in design and ending with limited malediction." CB-101976 AD-D755856 Subscriber Services Center American Medical Association P.O. Box 10946 Chicago, Illinois 60610 1-800-262-2650

Chandler, Robert W. **Tomorrow's War, Today's Decisions: Iraqi Weapons of Mass Destruction and the Implications of WMD-Armed Adversaries for Future U.S. Military Strategy.** McLean, Virginia: AMCODA, 1996, pp. 218. Chandler, a political scientist and career air force officer, "presents a composite of an early 21st Century adversary armed with weapons of mass destruction, and suggests the key elements of a new military plan that will correct current flaws and protect America's global security interests." CB-102301 AD-D755971 ISBN 0-9650770-0-4 (softcover) AMCODA Press 1390 Chain Bridge Road, #204 McLean, Virginia 22101 1-888-262-6322

Weaver, Greg and J. David Claes. **Inviting Disaster: How Weapons of Mass Destruction Undermine U.S. Strategy for Projecting Military Power.** McLean, Virginia: AMCODA, 1997, pp. 58. "This study examines the threat posed to U.S. power projection operations by weapons of mass destruction (WMD) in the hands of regional adversaries. It is based on the premise that the American experience in the 1991 Gulf War was in many ways misleading regarding the threat such weapons pose in regional conflicts."

CB-101894
AD-D755475
ISBN 0-9650770-1-2 (softcover)
AMCODA Press
1390 Chain Bridge Road, #204
McLean, Virginia 22101
1-888-262-6322

Planning a Conference/ Symposium???

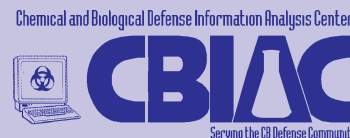
Let the CBIAC provide you with the technical, logistical, and administrative support you need!

We offer a dedicated staff of technical and administrative personnel trained to support conferences, symposia, and small working group meetings in all areas of Chemical Warfare/Chemical and Biological Defense. Currently the CBIAC supports several annual conferences, workshops, and symposia, both classified and unclassified, in the U.S. and abroad. The CBIAC offers the following support:

- Identification of Subject Matter Experts
- Solicitation of Keynote Speakers
- Mailing List consisting of over 5,000 names (national and international) within the CB Community
- Logistical/Administrative Support (invitation packages, technical agendas, correspondence packages, security issues, etc.)
- Technical Proceedings
- And much more!

For further information contact:

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The **CBIAC Newsletter** is a quarterly publication of the Chemical Warfare/Chemical and Biological Defense Information Analysis Center (CBIAC). The CBIAC is a Department of Defense (DoD) Information Analysis Center (IAC), administratively managed by the Defense Technical Information Center (DTIC) under the DoD IAC Program Office.

Government agencies and private industry under contract to the Department of Defense can contact the CBIAC for informational products and services. The CBIAC serves as the center for the acquisition, compilation, analysis and dissemination of information relevant to chemical warfare and chemical and biological defense technology.

The CBIAC is located in Building E3330, Aberdeen Proving Ground - Edgewood Area, Maryland 21010. For further assistance or information, visit or contact the CBIAC Monday through Friday from 8:00 a.m. to 4:00 p.m., EST:

Mailing Address: CBIAC
P.O. Box 196
Gunpowder Branch, APG,
MD 21010-0196

Tel: 410-676-9030 **Fax:** 410-676-9703
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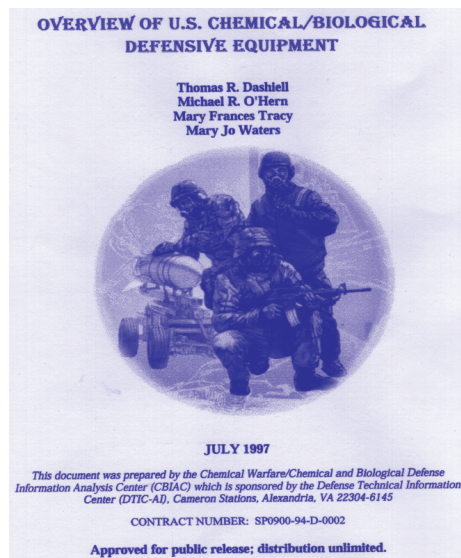
Judith M. Shetterly, CBIAC Administrator
Tel: 410-612-6412 **E-Mail:** shetterj@battelle.org

The Contracting Officer's Technical Representative for the CBIAC is Mr. Joseph D. Williams. He can be reached through his E-Mail address at jdwillia@cbdcom.apgea.army.mil or at the following address:

Technical Director, ERDEC
Attn: SCBRD-RTA (Mr. Joseph Williams)
APG-EA, MD 21010-5423

CBIAC's Latest State-of-the-Art Report!

An Overview of U.S. Chemical/Biological Defensive Equipment



CBIAC Product Number: **SOAR-97-03**

CB Number/AD Number: **CB-102354/AD-D755992**

Product Category: **State-of-the-Art Report**

Media: **Paperback**

Price: **\$95.00**

Distribution Limitation: **Unlimited**

Classification: **Unclassified**

Publication Date: **July 1997**

Availability: **CBIAC**

Description: This report profiles U.S. chemical and biological defensive equipment currently available or in development programs. Equipment in the categories of individual protection, detection and warning, collective protection and decontamination are presented. The overview highlights over 90 items and includes 100 photographs and/or sketches of the items. Many of the photographs and sketches are in color.

Ordering Information: Contact Judith M. Shetterly, CBIAC Administrator. Please allow 4-6 weeks for delivery.

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